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Arizona Five-Spined Ips

By Calvin L. Massey, Entomologist¹

The Arizona five-spined ips (*Ips lecontei* Swaine) is the most de-

structive bark beetle in central and southern Arizona. Although it ranges from northern Arizona and southern New Mexico south into Honduras (fig. 1), damage in the United States is limited almost exclusively to central and southern Arizona. Damage may become more widespread in the Southwestern United States as timber management is practiced on second growth and the thinning of ponderosa pine stands is increased.

¹ Rocky Mountain Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture, with headquarters at Fort Collins maintained in cooperation with Colorado State University; the author is located at Albuquerque and the research was done in cooperation with the University of New Mexico. The material contained herein is derived mostly from studies conducted by H. E. Ostmark, J. F. Chansler, and M. J. Stelzer.



Figure 1.—Generalized distribution of the Arizona five-spined ips

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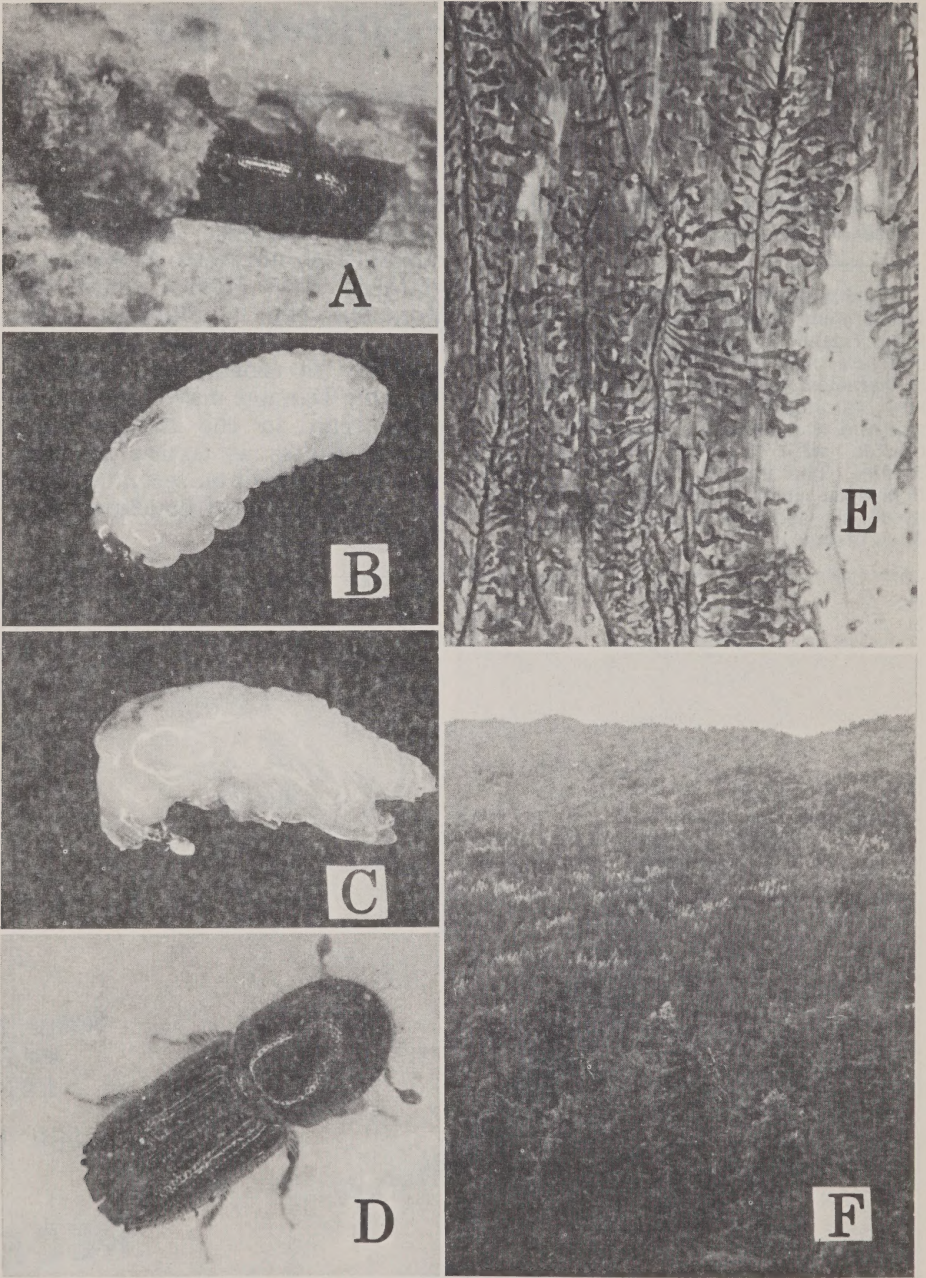


Figure 2.—Arizona five-spined ips: A, Female laying eggs; B, larva; C, pupa; D, adult; E, egg and larval galleries in inner bark; F, groups of trees killed by the beetle.

Economic Importance

Several thousand trees are killed each summer by *Ips lecontei*. The trees, sapling to pole size, are killed in groups of up to 125 (fig. 2 F). Occasionally, larger single trees growing under stress at homesites and in recreational areas are killed by the beetle. Timber management plans are impaired, cutting budgets disrupted, and at times infestations adversely affect areas of high esthetic value.

Hosts

In Arizona during the months of April to June, the insect prefers fresh slash and trees injured by natural forces, such as wind or lightning. The beetle prefers *Pinus ponderosa* Laws. but has been collected also from *Pinus monetezuma* Lamb., *Pinus oocarpa* Schiede, and *Pinus durangensis* Martinez.

Evidence of Infestation

Trees infested by the Arizona five-spined ips can be distinguished by fading foliage. Within a few weeks after infestation, needles in the topmost part of the crown change to a light straw color. The fading progresses until the entire foliage of the tree becomes yellow or yellowish brown. Further evidence of attack is the presence of reddish-brown boring dust in the crevices of bark and at the tree base. Mounds of reddish-brown boring dust can be found on the upper surface of slash infested by the insect.

Not all trees with the foregoing symptoms are infested only with *Ips lecontei*, *Ips pini*, and *Ips plagiographus* may attack the same trees attacked by the Arizona five-spined ips, especially during the spring when all three species are found intermixed in fresh slash.

Description of Stages

Young adults of the Arizona five-spined ips are light brown, but

darken to black as they mature (fig. 2, D). They are about $\frac{3}{16}$ of an inch long. Adult females lay small, white oval eggs (fig. 2, A). The eggs hatched into grublike, legless larvae (fig. 2, B) which, when fully grown, transform into pupae. The white pupae bear many of the adult characters, such as antennae and wing covers (fig. 2, C).

Life History and Habits

Ips lecontei overwinters as a mature adult in standing trees. Large numbers occur either in feeding galleries at the base of trees, or in areas of the tree that have escaped attack. In April and early May the adults emerge and attack fresh slash and injured trees in the nearby area. By the latter part of June, broods produced by the overwintering adults emerge and aggressively attack and kill groups of apparently healthy trees. Initial attack is usually confined to the upper 10 to 15 feet of the bole. The lower part of the trunk is then gradually attacked over a period of 1 to 2 months. From the time the overwintering adults emerge until the following winter, there are three complete generations; there is continuous flight and attack because of overlap of the generations and emergence and re-attack by parent adults.

The beetles are polygamous in nature. The male beetle initiates the attack by boring through the bark and forming a nuptial chamber in the inner bark. He is then joined by one to five females. Each fertilized female then constructs an egg gallery up to 25 inches long. There is an average of three galleries per nuptial chamber (fig. 2, E). The eggs are laid in niches on each side of the galleries, which are then plugged with frass. The female lays an average of 6.5 eggs per linear inch of gallery. Eggs hatch in approximately 1 week during the summer months. The larvae may feed gregariously for a short time, then

each forms a separate feeding gallery, initially perpendicular to the egg gallery, but then wandering generally at right angles to it in the phloem. After larvae develop to maturity—in 2 to 3 weeks—they form pupal chambers between the inner and outer bark and transform to pupae, and then to adults. During the summer months, from 4 to 5 weeks are necessary for the insect to develop from egg to adult.

Natural Control

Several hymenopterous insects and predaceous beetles parasitize and feed on both the mature and immature stages of this ips. Internal nematode parasites reduce the egg laying potential of infested females by as much as 50 percent. Winter temperatures of -5° F. and lower for a period of a few days cause extensive beetle mortality. These factors help to hold low populations of the beetle in check but are not sufficient to control epidemics.

Applied Control

During epidemics, pines of high value in recreational areas and at home sites may be protected from attack by the application of either of the following insecticides: Lindane, 1 percent emulsifiable concentrate in water; DDT, 1 percent wettable powder in water. The materials should be applied twice a year—in early spring and midsummer—to the entire bole until it is thoroughly wetted. The wettable powder formulations are less likely to damage treated trees.

To prevent broods from emerging from infested trees and attacking nearby green trees, all stages of the insect can be killed by applying emulsions of ethylene dibromide to standing or felled trees at the rate of 2 lbs. of active ingredient per 5 gallons of water.

Cultural Control

Sanitation practices are essential during certain parts of the year to prevent concentrated beetle attack. It is essential to dispose of all logging debris over 3 inches in diameter created in the spring and early summer. Such materials are especially important for the maintenance of overwintering adults. Prompt disposal of slash and cull produced during the spring months is necessary to protect ponderosa pine stands in logging areas from large group killings by *Ips lecontei* during July. Slash should be piled and burned before the beetles emerge or should be scattered in the open where the sun will dry it, making it unsuitable as breeding area.

Caution: All chemicals recommended are poisonous; careless use can endanger people, domestic animals, wildlife, and fish directly and by contaminating water supplies. Follow all directions and heed all warnings on the container label. Wear protective clothing. Avoid spilling, contact with the skin, or excessive inhalation. Wash exposed skin with soap and water. Always mix and apply formulations in the open air.

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